Claims

1. A cathode for a metal air electrochemical cell, the cathode comprising

(a) a first layer including about 30% to about 70% of an organic polymer by weight;

(b) a second layer including about 10% to about 30% of an organic polymer by weight; and

(c) a catalyst,

wherein the first layer and the second layer contact each other at a textured interface.

2. The cathode of claim 1, wherein the cathode includes from about 0.1% to about 20% of the catalyst by weight.

3. The cathode of claim 1, wherein the first layer includes a catalyst.

4. The cathode of claim 3, wherein the second layer includes a catalyst.

5. The cathode of claim 4, wherein the first layer and the second layer contain different catalysts.

6. The cathode of claim 1, wherein the catalyst is selected from the group consisting of manganese oxides, precious metals, metal heterocycles, and cobalt, and mixtures thereof.

7. The cathode of claim 6, wherein the catalyst is manganese dioxide.

8. The cathode of claim 7, wherein the cathode further comprises a silver catalyst.

9. The cathode of claim 1, wherein the textured interface is coated with a catalyst.

10. The cathode of claim 9, wherein the first layer includes a catalyst that is different from the catalyst coating the interface.

11. The cathode of claim 10, wherein the catalyst coating the interface is selected from the group consisting of platinum and silver catalysts.

12. The cathode of claim 11, wherein the catalyst coating the interface is a platinum catalyst.

13. The cathode of claim 12, wherein the cathode contains less than about 3% by weight of the platinum catalyst.

14. The cathode of claim 1, wherein the organic polymer is polytetrafluoroethylene.

15. A metal air electrochemical cell comprising:

an anode including an anode can and an anode gel;

a cathode, the cathode including a cathode can having at least one air access port and containing a cathode structure, the anode can and cathode can being assembled to form a cell; and

a separator electronically separating the anode and the cathode positioned between the anode gel and the cathode structure;

wherein the cathode structure comprises (a) a first layer including about 30% to about 70% of an organic polymer by weight; (b) a second layer including about 10% to about 30% of an organic polymer by weight; and (c) a catalyst, wherein the first layer and the second layer contact each other at a textured interface.

16. A method of making a cathode for an electrochemical cell, the method comprising combining carbon with $AgMnO_4$ to form a mixture, then preparing a cathode with the mixture.

17. The method of claim 16, wherein the electrochemical cell is a metal air cell.

18. The method of claim 16, wherein the electrochemical cell is an air-assisted alkaline cell.

19. The method of claim 16, further comprising combining the carbon and the $AgMnO_4$ with PTFE to form the mixture.

20. The method of claim 16, wherein the method comprises combining carbon with less than about 5 percent by weight $AgMnO_4$ to form the mixture.

21. A cathode for an electrochemical cell, wherein the cathode comprises manganese and silver, and wherein the cathode is substantially free of potassium.

22. The cathode of claim 21, wherein the cathode comprises less than about 7 percent by weight silver.

23. The cathode of claim 21, wherein the cathode contains less than about 3 percent by weight silver.

24. A cathode for a zinc air cell that has a current density of at least 70 mA/cm^2 at a voltage of -0.25 volts, versus a Hg/HgO reference.

25. The cathode of claim 24, wherein the cathode has a current density of at least 80 mA/cm^2 at a voltage of -0.25 volts, versus a Hg/HgO reference.

26. The cathode of claim 25, wherein the cathode has a current density of at least 90 mA/cm^2 at a voltage of -0.25 volts, versus a Hg/HgO reference.

27. The cathode of claim 26, wherein the cathode has a current density of at least 100 mA/cm^2 at a voltage of -0.25 volts, versus a Hg/HgO reference.

28. A cathode for an electrochemical cell, the cathode comprising a catalyst, wherein the cathode is prepared using $AgMnO_4$ as a catalyst precursor.